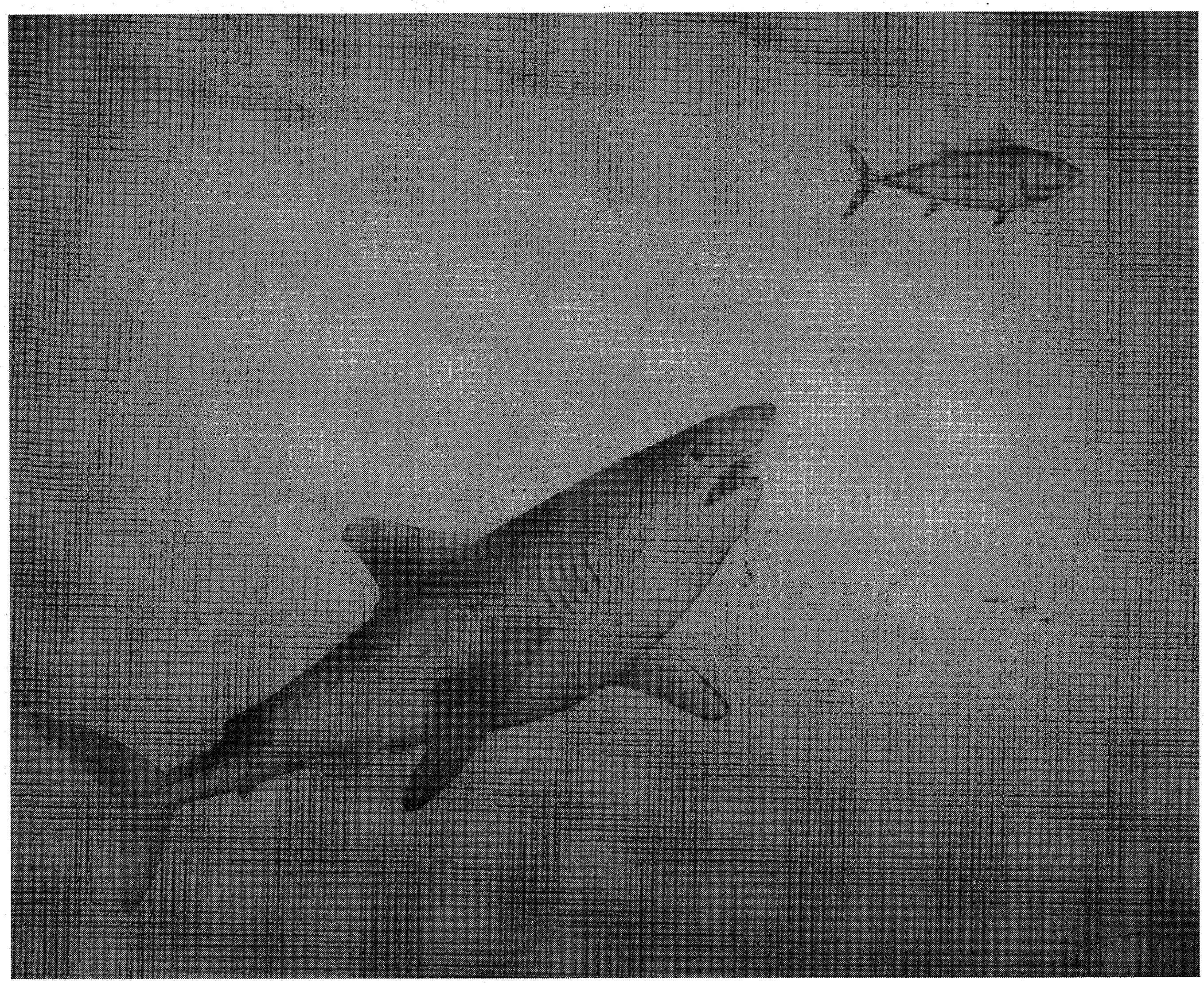
THE MOSASAUR



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Editor

Edward B. Daeschler
Academy of Natural Sciences of Philadelphia
1900 Benjamin Franklin Parkway
Philadelphia, Pennsylvania 19103 USA

Associate Editor

Edward S. Gilmore

Layout Editor

Claudia Wilke

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COVER ART– "*Parotodus* Stalking Tuna" by David J. Kent.

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A Pleistocene Mollusk Assemblage from Cooper River, New Jersey

STEPHEN KURTH, ERIC KURTH
Delaware Valley Paleontological Society
Philadelphia, Pennsylvania

ABSTRACT — A new fossil locality containing a unique molluscan assemblage was recently uncovered in Pennsauken, New Jersey, along the banks of Cooper River, a tributary of the Delaware River. The fossils contained within this deposit represent a freshwater/brackish water bivalve fauna. The plant and mollusk specimens found suggest a Pleistocene Age. The fauna found here bears some similarity with that of the well known Fish House Clay, which is found several miles to the north, along the Delaware River. The Fish House Clay deposit represents the only other freshwater Pleistocene site within this region of the country. This makes a comparison of the two a useful study for the description of non-marine paleoenvironments in New Jersey.

Introduction

The fossil deposit was uncovered by excavations along the northern bank of Cooper River in Pennsauken, New Jersey. The purpose of the excavations was as part of a flood abatement project in which a small tributary of Cooper River was to be connectedby a culvert to the main stream.

The project reached the River in December of 1995. At this time the digging reached a depth of approximately 15 feet down and 20 feet wide, extending from Park Drive into Cooper River. Until this point, no fossils were found, despite careful examination of the diggings. The excavated material was placed in an adjacent field in Cooper River Park. These spoil piles were immediately covered by a snow storm late in the month. Early in January enough snow had melted to allow the site to be investigated. The ground was partially frozen in some areas and saturated with water in others, making collecting very difficult. In spite of this, over 100 mollusk specimens were found, along with a large amount of plant material. The vast majority of fossil remains found consisted of bivalve steinkerns which were found scattered throughout the excavated material.

Most notable in the fauna are forms which were clearly related to the freshwater unionid clams found today in rivers and lakes, along with several other species which appear to be from a brackish water fauna. The largest clams have been identified by Arthur Bogan as *Elliptio complanata* Lightfoot, 1786 (Arthur Bogan pers. comm.), of the family Unionidae. This species was one of those commonly found at the Fish House clay pits, and is still living in Cooper River and other creeks in the area. The other specimens have proven more difficult to identify. The shell material remaining on many of the steinkerns is brown and very thin, making identification difficult. Some have been identified as from the genus *Rangia*, a clam which is commonly found in brackish water marshes. These steinkerns most closely resemble the species *Rangia cuneata*. The unidentified specimens also appear to be marine or brackish water mollusks.

The presence of *Rangia* is interesting not only because it is a brackish water species, but also because its current range is restricted to warmer waters in the southern Atlantic Coast. The northern-most living populations of *Rangia* are found in Maryland, along the Chesapeake Bay and the mouth of the Potomac River (Abbott, 1974). However, at a number of localities along the coast, from Florida to New Jersey, fossil shells of *Rangia cuneata* have been found (Hopkins, 1970). These specimens are generally considered to be Pleistocene in age. Cold weather has resulted in mass die-offs of modern populations off the coast of Maryland (Gallagher and Wells, 1969.) This suggests the Cooper River fauna existed during a warm interglacial period within the Pleistocene.

Comparison With Fish House

Comparison with the Fish House fauna reveals a number of major differences. The diversity of the Cooper River site appears to be much lower. A rough examination indicates four species of mollusks while Bogan et al. (1989) lists 12 species in the Fish House Clay, all of them unionids. Only one species from Cooper River has been positively identified as an unionid, with it composing less than 20% of the specimens collected. Gastropods are absent in the Cooper River assemblage, as well as any terrestrial or aquatic vertebrates which have also been found at Fish House. This may be due to preservational differences or to the much smaller extent of the exposure.

The size of the fossils also distinguishes the two sites. The largest *Elliptio* from Cooper River was smaller than all except the smallest of the equivalent species from Fish House specimens in the collection at the Academy of Natural Sciences of Philadelphia. The largest complete individual measured 55mm, while a fragmentary example would have been possibly 110mm when complete. According to Bogan (1989), the Fish House unionids are larger than modern species found in the Delaware and its tributaries. The smaller size of the Cooper River Unios may indicate a stressed environment. Further evidence of this is the presence of spots on some of the specimens.

Preservation of the fossils is very similar in both sites. However, there are some important differences. The preservation of the Cooper River bivalves is somewhat better, with many having moderate amounts of shell preserved, while almost no shell remains from Fish House.

Another difference is the position of the valves. Approximately 30% of the ANSP specimens from Fish House have the valves of the mollusks in a gaping position, indicating post-death transport. Practically all of the Cooper River specimens are either closed or nearly so, which is characteristic of life position. Unfortunately, since none have been found in-situ, it cannot be determined how they were oriented in the sediment.

Stratigraphy and Geology

The stratigraphy and geology of the site was difficult to examine, since the trench was generally off limits during the excavation period. In addition, the fossils were uncovered during the winter of 1996, with the greatest amount of snowfall ever recorded in the area. By the time the snow had melted, most of the trench was already covered over. The formation which was exposed consisted of blocks of clay and silt of various consistencies. Superficially, they resembled Cretaceous formations found in the vicinity. However, closer examination revealed that they were reworked material. Some consisted of bright green clay, similar to that of the Merchantville formation. More common was a black, greasy, micaceous clay resembling the Woodbury formation. During the Pleistocene, Cretaceous exposures on the inner coastal plain were extensively eroded and then redeposited along rivers and streams. The lignite was usually found along with the black clay, however, much of the clay was empty of fossils. The mollusks were found scattered across the site, so it is hard to tell exactly which layer they came from.

The quartz pebbles and sand found in the locally common Pleistocene Pennsauken Formation appear to be absent from the material containing the fossils. However, the local environment of the site could have allowed the simultaneous deposition of a very different matrix.

The exact dating of the fossil specimens is extremely difficult with the available evidence and lack of similar sites in the eastern US. Carbon dating could help answer this question. Test boring of the area would also be of immense value, possibly correlating this site with that of the Fish House Clay and determining the depth of the Cretaceous formations which this material overlies.

Conclusion

The brackish water/fresh water nature of the fauna found here suggest a transgressive phase of marine water into the area. This could be the result of an interglacial sea-level rise, creating an estuarine/bay type environment further north of its present limit in Delaware Bay. The timing of this event would be interesting to relate with that of the deposition of the Fish House Clay, which clearly occurred in a pure fresh-water environment. A study of micro-fauna which may be found within the clay could also be of great value in further determining the salinity of the environment of the site examined and that of various adjacent layers. The result would be a clearer picture of the sequence of sea level changes occurring during the Pleistocene. This site may also hold interesting information regarding the reaction of a fresh-water fauna to the incursion of ocean water, due to an increase of sea level.

This investigation of these fossils is preliminary. It is the authors' hope that this information will be of value to future research of Pleistocene geology and paleontology of the Delaware Valley region.

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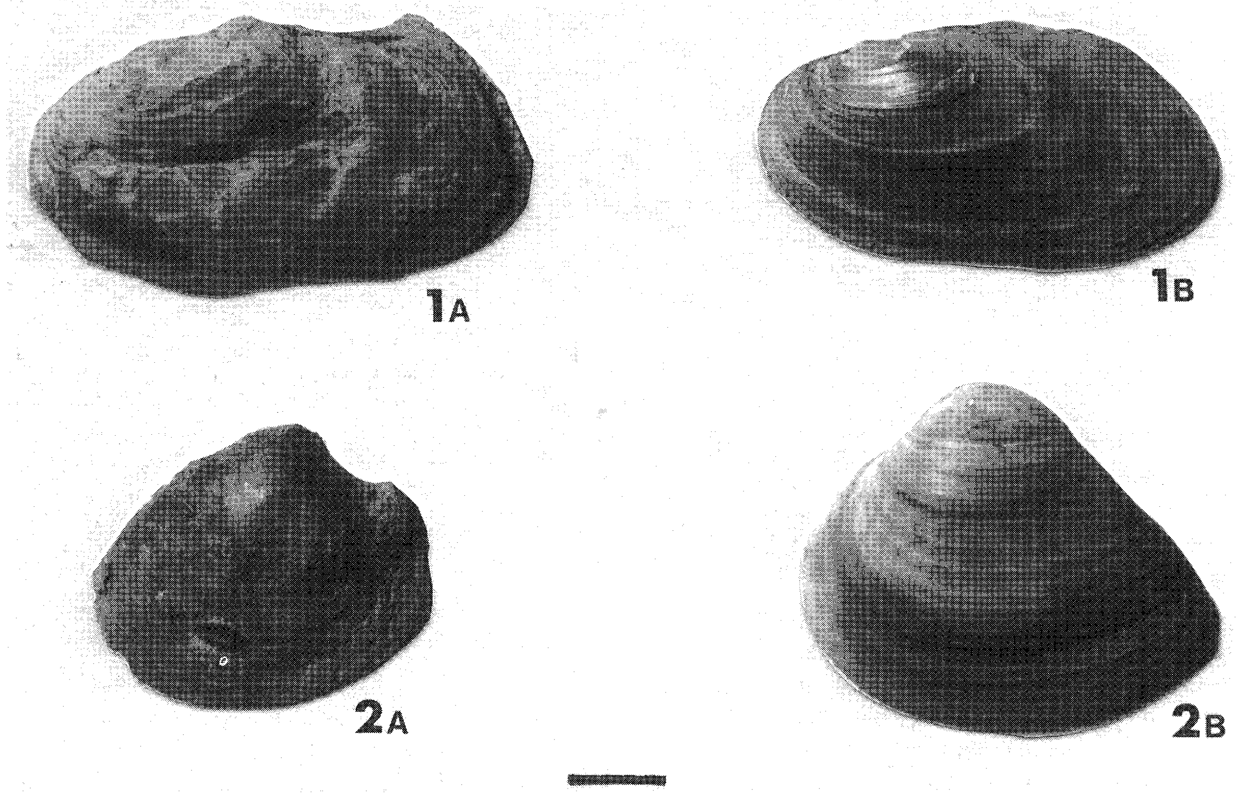

Plate 1. Comparison of bivalves from Cooper River site, Pennsauken, New Jersey, with modern specimens of the same genera. 1A - Cooper River *Elliptio* sp.; 1B - modern *Elliptio complanata* (ANSP #113902); 2A - Cooper River *Rangia* sp.; 2B - modern *Rangia cuneata* (ANSP #215496).